

**Statewide Railroad Agreement**  
***“Semiannual Locomotive Technology Symposium”***

**California's Locomotive  
Emission Reduction Needs**

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***(El Monte, California - November 28, 2007)***

**California Environmental Protection Agency**



**Air Resources Board**

## 2005 Statewide Locomotive Emissions (tons/day)

AIR BASIN	NOx	PM
Mojave Desert	39	1.3
South Coast	32	1.0
San Joaquin	24	0.7
Sacramento	20	0.6
Bay Area	13	0.3
Salton Sea	9	0.3
Rest of the State	21	0.6
Statewide Total	158	4.8
% of Statewide Mobile Sources	5%	3%

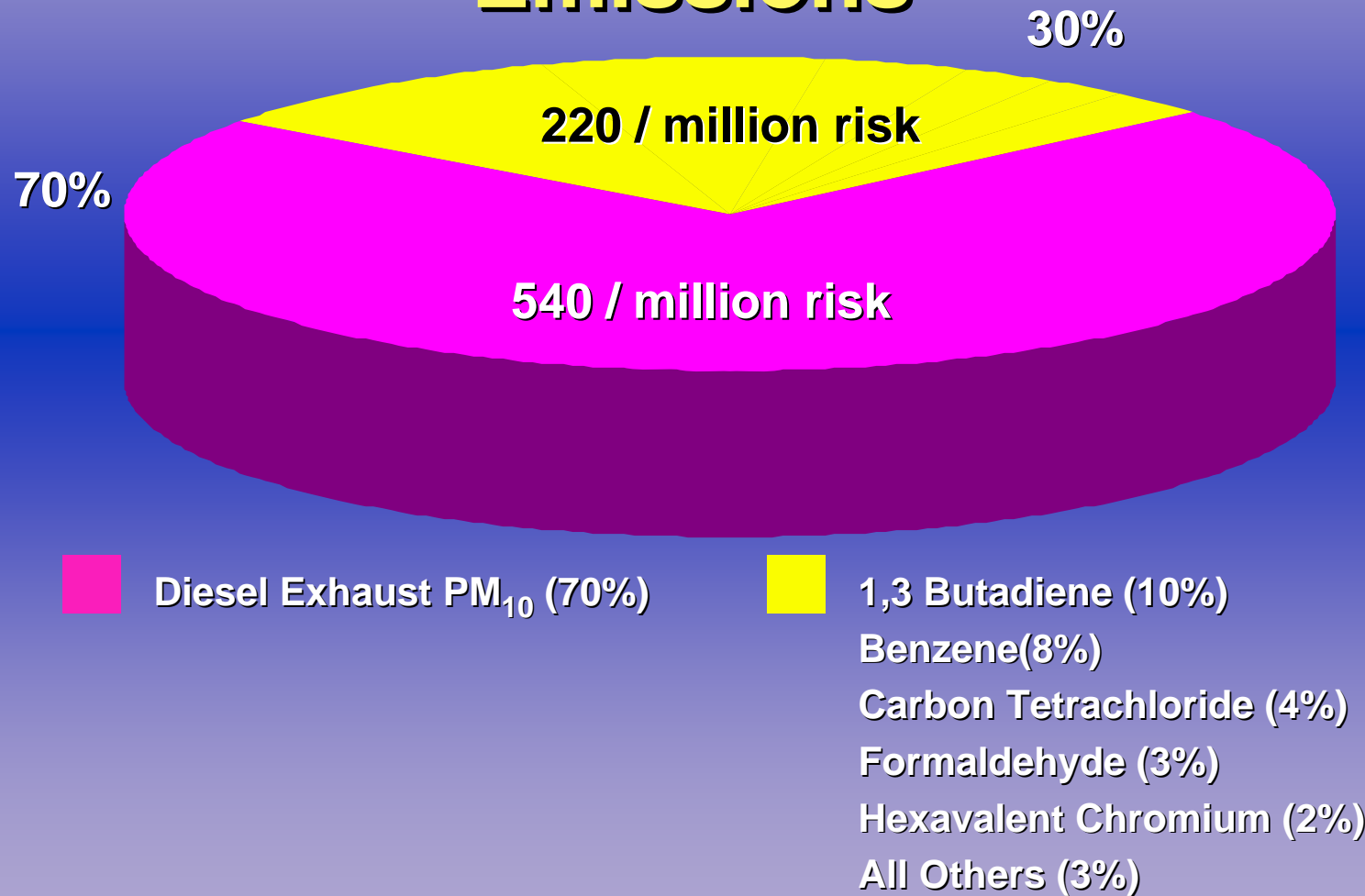
# California's Locomotive Emissions

## Which Types of Locomotives Contribute to California NOx Emissions?

YEAR	Statewide Locomotive * <b>NOx</b>	Line Haul	Switch	Passenger
2000	6%	90%	5%	5%
2010	4.5%	88%	5%	7%
2015	6%	86%	5%	9%
2020	8%	86%	4%	9%

\* % of statewide mobile source emissions.

# Diesel PM Responsible for 70% of Year 2000 Statewide Risk from Air Toxic Emissions\*



\*Air Resources Board Risk Reduction Plan

***UP Commerce Railyard***  
(near I-710)



## California's Railroad Strategies

# California's Locomotive and Railyard Strategies

- Statewide Railyard Agreement (2005)
- California's Goods Movement Emission Reduction Plan (2006)
- CARB Diesel Fuel Regulation Extended to Intrastate Locomotives (2007)
- ARB Cargo Handling Equipment Regulation (2007)
- State Implementation Plans (2007)
- U.S. EPA locomotive rulemaking (2008-2017)
- Locomotive NOx Fleet Average Agreement (2010)
- Goal: > 90% reduction in diesel PM and NOx by 2020



# California's Goods Movement Emission Reduction Plan

- ARB Board approved Goods Movement Emission Reduction Plan (April 2006)
- Proposed locomotive provisions include:

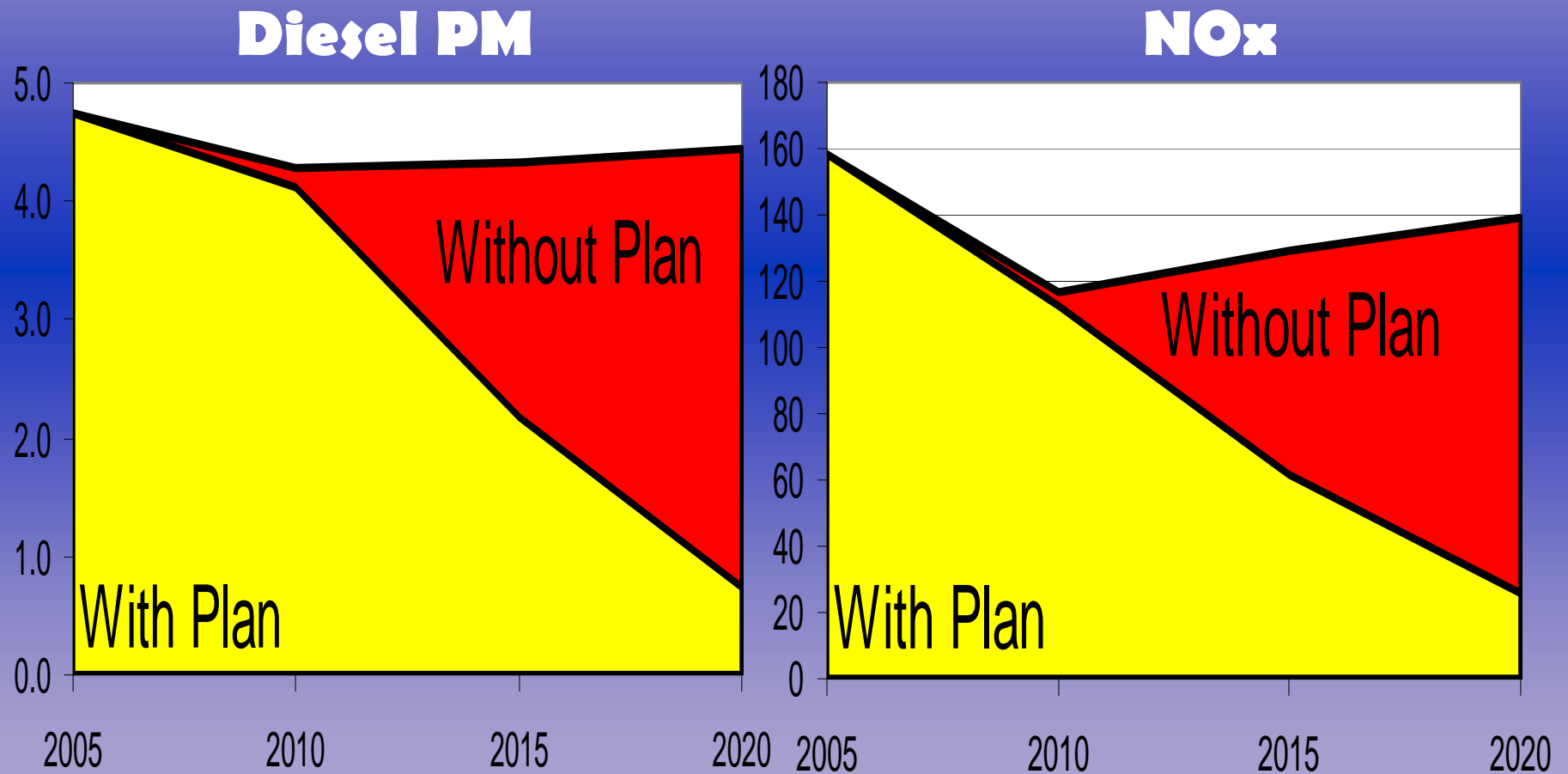


***Ports of LA and LB***

- Tier 4 locomotives on an accelerated basis (2012-2021)
  - 10% annual fleet turnover to Tier 4
- Tier 2 locomotives upgraded to Tier 2.5
  - 5% annual remanufacturing
- Replace switchers by 2010

# Strategy Impact on Locomotives

(Emissions in tons per day, 2005-2020)





# CA Low Emitting Switch Locomotives

- 450 California-based locomotives (UP and BSNF).
- New low emitting gen-set switch locomotives.
  - 28 now in service; 32 more by 2008 (Southern CA).
  - 10 more expected by late 2007 (Northern CA).
  - Up to 90% reduction in NOx and diesel PM.
- 12 Electric-Hybrids (Green Goats).
- 4 LNG's in service in LA since 1990's.
- Goal to turnover intrastate fleet by 2010.



# California's Locomotive Emission Reductions Needs

# U.S. EPA Locomotive Rulemaking

- ARB submitted comments on proposed rulemaking.
- ARB supportive of most elements
  - Believe several portions should be strengthened, expanded, and accelerated.
  - Tier 0-3 locomotives may still comprise up to 90% of national fleets by 2020.
  - California has shortfall of 60-80% NO<sub>x</sub> and 25-50% PM.
  - Need to accelerate Tier 4 introduction.
  - Need process to certify and require aftertreatment on existing line haul locomotives.
- Final rule anticipated by the end of 2007.

***U.S. EPA Locomotive Exhaust Temperature  
Tunnel Testing – Donner Summit –  
August 2007***





# Recent Revisions to State Implementation Plan for South Coast

- Tier 4 Locomotive Acceleration in South Coast
  - NPRM - 10 ton/day locomotive NOx shortfall 2012-2014.
  - U.S. EPA needs to provide the NOx reductions or funding to obtain equivalent NOx reductions.
- Metrolink Passenger Locomotives
  - NOx SCR retrofit to provide up to 3 tons/day of NOx.
- ARB Commitment to Line Haul Locomotive Agreement
  - Accelerate introduction of Tier 4 line haul locomotives.
  - Present enforceable agreement to ARB Board in 2008.

# Technology Assessments

- Diesel oxidation catalyst retrofit to 1992 line haul locomotive
- Diesel particulate filter retrofits on two older switch locomotives
- ARB contract with SWRi to retrofit SCR to existing line haul locomotive engine

***Diesel Oxidation Catalyst***



***Diesel Particulate Filter***



# California's Needs for New and Existing Line Haul Locomotives

- Need 60-80% NOx and 25-50% PM beyond NPRM
- Need a certification program for aftertreatment to retrofit to existing line haul locomotives
  - Could certified aftertreatment be required upon remanufacturing (about every 4-8 years)?
- Need acceleration of Tier 4 locomotives into California
  - Earlier introduction (prior to 2017)
  - Greater rate of fleet turnover